FUNCTIONAL CEILING SYSTEM

Field of the Invention

The present invention relates generally to a ceiling system, and more particularly to a metal grid channel ceiling system that provides the possibility of mounting and dismounting the ceiling without using bolts or nuts.

Prior Art

Metal grid channel ceiling systems have a widespread use as ceilings to give a "homelike" atmosphere in large buildings, or, more correctly, buildings with a large ceiling height. One of the most common usage's for functional ceiling systems is probably as ceilings in furniture warehouses, where it is important to provide a homelike atmosphere in a large building, in order to be able to present the furniture in a correct environment, although other usage's may be e.g. offices, stores etc. The most common way to achieve such environment is to provide a ceiling comprising a metal grid, comprising metal grid channels and ceiling accessories components to put in between the channels and the metal grid.

The prior art devices for such ceiling systems generally comprise a grid consisting of primary channels and secondary channels, where the length of the secondary channel equals the length of the primary channel minus the width. By such choice of channel lengths, the ceiling system will comprise grid square modules, as will be evident from the following.

The primary and secondary channels are mounted by means of a hanger bracket, one for each cross point of primary and secondary channels. The hanger bracket is provided with hanging means, which make it possible to hang

the entire, mounted system from the original ceiling at a suitable height.

The main problem for functional ceilings have been that the secondary channels are joined with the primary channels by means of a welded end plate. This welded end plate make the secondary channels more expensive than necessary, and, furthermore, adds a weakness point to the construction. The welded end plate is connected to the primary channel by means of bolts, rivets or the like. Connecting by bolting or riveting is time consuming and gives room for mistakes. One further disadvantage is that the welded end plates constitute a weak point. If the weld between the channel and the end plate collapses, the entire ceiling system can collapse, which could lead to serious accidents.

Packaging of channels with welded end plates also constitutes a problem. In fact, the packaging volume for channels with welded end plates is 46% larger than for channels without welded end plates.

The use of bolts to join the primary and secondary channels increases the risk that primary channels are not joined tight enough. This gives an appearance of the entire ceiling that is not very pleasing to the eye.

One important feature with functional ceilings is the possibility to host cables, like e.g. electrical services, tele- and data-communication cables, in the channels of the metal grid net. With the prior art grids, there have been problems with accommodating cables in the secondary channels, since the access of the cabling work has been interrupted by a "wall" perpendicular to the length axis, in connection to the hanger bracket. This gives a problem, in that the sharp metal edges of the narrow opening might wear the skin of the cables, which ultimately could lead to a fire.

Summary of the Invention

The present invention aims to solve the above-mentioned and other problems by providing a functional ceiling system comprising primary channels, secondary channels, generally perpendicular thereto, and hanger brackets for connecting the primary and secondary channels. The hanger bracket includes hanging means for hanging said ceiling system from an original ceiling. Wings are provided at the ends of the secondary channels for insertion in overlapping slots in the primary channels and in the hanger bracket, locking the primary channels and the secondary channels to the hanger bracket.

Brief Description of the Drawings

The accompanying drawings show preferred embodiments of the invention, wherein;

Fig 1 is an exploded perspective view showing a connection point between primary and secondary channels.

Fig 2 is a perspective view showing a hanger bracket according to the present invention.

Fig 3 is a perspective view showing one end of a secondary channel according to the present invention.

Fig 4 is a perspective view showing one end of a primary channel according to the present invention.

Fig 5 is a perspective view showing a connector for use in one embodiment of the present invention.

Fig 6 is a side view showing one side of the connector in fig 5.

Fig 7 is a side view showing one end of the connector in fig 5.

Fig 8 is a perspective view showing the embodiment according to figs 1-7 in an assembled state.

Fig 9 is an exploded perspective view showing a second embodiment of the present invention.

Fig 10 is a perspective view showing a hanger bracket adapted for use in corners or along grid terminations.

Fig 11 is a perspective view showing the hanger bracket according to fig 10 in an assembled state.

Detailed Description of a Preferred Embodiment

Fig 1 shows an exploded view of a connection point in a functional ceiling system 1, comprising two primary channels 10 and two secondary channels 20. Further a hanger bracket 40 and two connectors 50 are shown. Components and functions of the primary channels 10, secondary channels 20, hanger bracket 40, and the connectors 50 will be more thoroughly described in the following.

Fig 2 shows an enlargement of the hanger bracket 40, comprising a bottom portion 40a, a first side 40b, a second side 40c, hanging means 41, primary slots 42, secondary slots 43, projections 44, locking means 45, and hooking means 46.

Fig 3 is a perspective view showing one end of a secondary channel 20. As can be seen, the secondary channel comprises a bottom portion 20a, side portions 20b, and stabilising portions 20c. The ends of the side portions 20b are provided with wings 21 and hooking means 46'. The wings 21 are provided with bending facilitating means 22, in the form of holes, and locking means 45'.

Fig 4 is a perspective view showing one end of a primary channel 10, comprising a bottom portion 10a, side portions 10b and stabilising portions 10c. The side portions 10b are recessed close to the end of the primary channel 10, and each of these recessed portions is provided with a primary slot 11 and a secondary slot 12. The end of each recessed portion has a semicircular indentation 13.

Fig 5-7 show various views of the connector 50. The connector 50 comprises a rounded top portion 50a, a side portion 50b, and two fins 51. The fins 51 comprise a base 53 and a top portion 52. The top portion is wider than the base, which makes a cross section of a fin have the shape of a "T". Furthermore, the connector 50 is provided with a hook 54.

Fig 8 shows the connection point assembled. A hanging rod 61 is also shown. The assembling of the connection point will be described in the following with reference to the above-described drawings.

The connecting point assembly starts with the ends of the primary channels 10 being pushed over the hanger bracket 40,as can be understood by comparing fig 1 and 8. As is evident from the figures, the side portions 40 b, 40 c of the hanger bracket 40 fits in the space provided under the stabilising portions 10c of the primary channels. The bottom portion 40 a of the hanger bracket 40 fits between the side portions 10 b of the primary channel. The primary channels 10 are pushed along the hanger bracket 40 until the semicircular indentations 13 on the outer ends of the primary channels engage the projections 44. As the semicircular holes 13 engage the projections 44, the primary and secondary slots 11, 12 on the recessed portion of the primary channel will overlap the primary and secondary slots 42, 43 on the hanger bracket. The attachment of the primary channels on the hanger bracket will hereinafter be referred to as the first assembly step.

Hence, the stabilising portions 10c of the primary channels do not only provide an improved stability to the side portions of the primary channels, but also serve as a connection means in the connection between the hanger bracket and the primary channel, the side walls 40b, 40c of the hanger bracket 40 being received under the stabilising portions 10c of the primary channels 10.

A second assembly step includes fastening of the secondary channels 20 in the hanger bracket 40. As mentioned above, the primary slots 11 and the primary slots 42 overlap, which makes it possible to insert the wings 21 in the overlapping slots 11, 42. Of course, the size of the overlapping primary slots 11, 42 should be such that the wings 21 of the secondary channel 20 can be received in the slots without unnecessary clearance. Insertion of the wings 21 in the overlapping slots 11, 42 also leads to the hooking means 46, 46' engaging one another, locking the upper part of the secondary channel to the hanger bracket. The insertion of the wings 21 in the overlapping primary slots 11, 42 also locks the position of the primary channels 10 with respect to the hanger bracket 40, due to the wings 21 being received of the in the overlapping primary slots 11, 42.

A third assembly step includes bending of the wings 21, in order to lock the secondary channel 20 to the hanger bracket 40. Preferably, the wings 21 are bent "inwards", i.e. towards one another. By careful positioning of the bending facilitating means 22, a "pulling" action, that minimises the clearance between the hanger bracket and the end of the secondary channel 20, can be achieved. This can preferably be achieved by positioning the bending facilitating means 22 close to the secondary channel side portion 20b. As the wings 21 are bent towards one another, the locking means 45' of the wing and the protruding locking means 45 of the hanger bracket 40 engage, which prevents the secondary channel 20 from "popping" upwards, which could lead to a disintegration of the connection point.

The fourth step includes attaching the connector 50 to the recessed sides of the primary channels 10, inserted on the hanger bracket 40 and over the bent wings 21. This is done by inserting the bases 53 of the fins 51 in the

secondary overlapping slots 12, 43. The broader top portion 52 of the base 53 of the connector 50 prevents the bases from popping out of the secondary overlapping slots 12, 43. The hook 54 "pops" over the bent wings 21, and prevents the connector from disengaging the overlapping slots 12, 43. The insertion of the bases of the fins in the overlapping slots 12, 43 locks the position of the primary channels 10, which prevents clearance between the primary channels, which leads to a better appearance. The connectors are preferably inserted with the "backsides" facing each other, i.e. the side of the sidewall 50b not comprising the fins projecting towards the other connector 50. By such insertion, the bent wings 21 of the secondary channel 20 will be locked in the bent position, which gives an extra security against the locking means 45, 45' disengaging each other, and also from disengagement between hanger bracket 40 and secondary channels 20.

As can be seen in fig 5-7, the connector comprises a rounded top portion 50a. The roundness of the top portion prevents cables housed in the secondary channel from being worn against a sharp sheet metal edge.

An alternative embodiment of the present invention is shown in fig. 9. In this embodiment, the connector is replaced by screws, that secure the wings 21 from being straightened out, and hence loose the engagement with the hanger bracket 40. This embodiment is however presently seen as inferior to the embodiment shown in figs 1-8, but is shown as an example of how the invention could be carried out, without deviating from the scope of the invention.

In fig 10, a hanger bracket 40' adapted for corners and grid terminations is shown. It comprises the same features as the hanger bracket embodiment described above, but one end of the hanger bracket is cut away and replaced

by a cover portion 62, preferably lacquered in the same colour as the channels 10, 20.

In case the hanger bracket 40' is to be used in a termination, i.e. where three channel ends are connected to one another. One end of a primary channel 10 is pushed along the hanger bracket 40' and two secondary channels 20 are connected to the hanger bracket, and lock the primary channel 10 to the hanger bracket 40 the same way as described above.

In case the hanger bracket is used in a corner, only one secondary channel is connected to the hanger bracket. The other side of the hanger bracket, i.e. the side of the hanger bracket opposite to the connection of the secondary channel to the hanger bracket, is covered with a corner cover 64. The corner cover 64 is preferably lacquered with the same colour as the primary channels are. A clip 65 is used to attach the corner cover 64 to the hanger bracket 40', in a way that is well understood by a person skilled in the art. Also shown is a connector 50.

Fig 11 shows a grid corner using the above-described adapted hanger bracket.

The choice of materials for the various components can be as follows, although variations of the materials are possible within the scope of the invention. The preferred material for the primary and secondary channels 20, 10, is sheet metal plate, that could have a thickness of about 0,7 mm. Preferably, the channels are lacquered in order to protect them from rusting, and to give a better appearance. The ductility of the sheet metal should be chosen such that the wings 21 could be bent back and forth at least a dozen times, without disintegrating from the secondary channels 20.

The preferred material for the hanger bracket 40 is electroplated sheet metal, with a thickness of about 1,5 mm. There is no need for the hanger bracket to be

lacquered, since the hanger bracket is not visible after the functional ceiling 1 has been mounted. However, the hanger bracket 40', for corners and terminations, should preferably be lacquered, since parts of the hanger bracket 40' will be visible after mounting.

The preferred material for the connector is plastic, preferably a thermoplastic. By choosing a thermoplastic as the material for the connector, a number of advantages can be achieved:

- Thermoplastics can be injection moulded, which is a cost-effective method for producing items of complex form.
- Thermoplastics are electrically insulating. This gives an extra security when electric cables are hosted in the secondary channel.
- Thermoplastics are resilient enough to allow insertion even if the space provided by the overlapping slots is a little bit too narrow.

As implied above, and as can be seen in fig. 8, the ceiling system is hung from the original ceiling by means of the hanging rod 61. The hanging rod can e.g. be a threaded rod, but also a rope or a wire rope, if this should be more appropriate.